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DENSITY, NEST SITES, DIET, AND PRODUCTIVITY OF COMMON BUZZARDS (*BUTEO BUTEO*) IN THE ITALIAN PRE-ALPS

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Abstract.—We studied a Common Buzzard (*Buteo buteo*) population of 32–35 territorial pairs between 1993 and 1999 in a 113-km^2 plot located in the central Italian pre-Alps. Density progressively increased from 28 to 31 pairs/100 km^2. Territorial pairs were regularly dispersed with a mean distance from the nearest occupied nest of 1108 m (N = 108). Eighty-one percent of 108 used nest sites were on cliffs, while the remaining 19% were placed on mature trees. Each year, 16–21% of the nests built by Common Buzzards were taken over by migratory Black Kites (*Milvus migrans*). Mean laying date was 9 April (earliest = 7 March, latest 30 April, N = 45). Mean clutch size was 2.32 (N = 19). Hatching success was 91% (N = 33 eggs from 14 clutches). Mean brood size at hatching was 2.14 (N = 14). Eighty-nine percent of the territorial pairs laid eggs (N = 37) and 72% raised at least one chick to fledging (N = 100). Mean number of fledged young was 1.07 per territorial pair (N = 100), 1.11 per reproductive pair (N = 33), and 1.49 per successful pair (N = 72), with no significant differences among years. Diet was dominated by medium to small passerines, small mammals, and snakes. Recorded density and productivity were comparable and often higher than those reported for other European populations. Human persecution was high until the 1970s, but is currently unimportant. Future conversion of young coppice stands to mature forest could further favor pre-Alpine populations of Common Buzzards.

Key Words: *breeding success*; Buteo buteo; *Common Buzzard*; *density*; *diet*; *forestry*; *Italy*; *pre-Alps*.

Densidad, sitios nido, dieta y productividad de los gavilanes comunes (*Buteo buteo*) en los Pre Alpes Italianos

Resumen.—Estudiamos una población de gavilanes comunes (*Buteo buteo*) de 32–35 parejas territoriales entre 1993 y 1999 en una parcela de 113 km^2 localizada en los pre Alpes del centro de Italia. La densidad incremento progresivamente de 28 a 31 parejas/100 km^2. Las parejas territoriales estuvieron dispersas regularmente con una distancia media al nido mas cercanamente ocupado de 1108 m (N = 108). Ochenta y uno por ciento de los 108 sitios nidos usados estaban en cornisas, mientras que el restante 19% estaban ubicados en árboles maduros. Cada año, 16–21% de los nidos construidos por gavilanes comunes tomados en posesión por milanos negros migratorios (*Milvus migrans*). La fecha media de postura fue 9 de abril (los primeros = 7 marzo, los mas tardíos 30 de abril, N = 45). El tamaño medio de la postura fue 2.32 (N = 19). El éxito en la postura fue 91% (N = 33 huevos de 14 nidadas). El tamaño medio de la nidada en la postura fue 2.14 (N = 14). Ochenta y nueve por ciento de las parejas territoriales pusieron huevos (N = 37) y 72% sacaron adelante al menos un polluelo hasta volantón (N = 100). El numero promedio de jóvenes volantones fue 1.07 por pareja territorial (N = 100), 1.11 por pareja reproductiva (N = 33), y 1.49 por pareja exitosa (N = 72), sin diferencias significativas entre años. La dieta fue dominada por passeriformes medianos a pequeños, pequeños mamíferos, y culebras. La densidad y productividad registradas fueron comparables y a menudo mas altas que aquellas reportadas para otras poblaciones europeas. La persecución humana fue alta hasta los 70's, actualmente no es importante. La futura conversión de los bosquecillos jóvenes a bosques maduros podría favorecer mayormente a las poblaciones pre-alpinas de gavilanes comunes.

[Traducción de César Márquez]

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The Common Buzzard (*Buteo buteo*) is one of the most abundant European raptors (Bijlsma 1997). Except for a possible decrease in Sweden (Ryttman 1994), its populations are generally stable or increasing, and in some areas still recovering from declines caused by pesticide poisoning and human persecution in the 1950s and 1960s (Taylor et al. 1988, Bijlsma 1997). Factors currently limiting density, productivity, and range expansion, include low availability of food and nest sites, direct persecution, and poisoning (Newton et al. 1982, Elliott and Avery 1991, Gibbons et al. 1994, Graham et al. 1995).

In Italy, the Common Buzzard occurs from sea level to an elevation of 1800 m in the Alps (Canova 1992). However, despite its abundance and wide distribution, the species' breeding ecology and population trends are virtually unknown. The few existing estimates refer mainly to the density of territorial pairs and are usually based on low sample sizes (Canova 1992). In this paper, we present data on density, nest spacing, diet, and productivity of a sedentary population of Common Buzzards studied for seven years in the Italian pre-Alps.

STUDY AREA

The study area is a 113-km^2 plot located along the Italian margin of Lake Lugano, within the central Italian pre-Alps (45°55'N, 8°50'E). Altitude ranges from 275–1125 masl. The landscape is characterized by forested mountain slopes interspersed with medium-sized cliffs and rare patches of herbaceous and scrub vegetation, caused by frequent burning. Overall, open areas were scarce, mainly due to human modifications, and concentrated on the valley floors. The area included 16 small villages, all located on the valley floors. Seventy-one percent of the area was covered by woodland, 13% by urban areas, 9% by water bodies, 6% by natural grassland, and 1% by farmland.

Dominant tree species in the forest included sweet chestnut (*Castanea sativa*), downy oak (*Quercus pubescens*), sessile oak (*Quercus petraea*), European hop-hornbeam (*Ostrya carpinifolia*), and locust tree (*Robinia pseudoacacia*). Forests were managed for timber production primarily by means of stool shoots regeneration (coppice system; Matthews 1989), with a rotation of 20–30 yr. Mature trees were often maintained as single individuals or in small clumps as seed bearers (coppice with standards; Matthews 1989). However, most of the woodland had been recently felled and consisted of a homogeneous cover of young second growth forest. Some young woodland patches were being converted to mature woodland, but at the time of study mature forest was still concentrated on a few steep slopes.

Except for forestry operations, human activities were mainly confined to lowlands and mostly absent from the mountain slopes. Climate is temperate continental with wet springs and dry summers (Pinna 1978). Further details on the area can be found in Sergio and Boto (1999)

METHODS

Common Buzzards were surveyed between 1993 and 1999. We censused territorial pairs during the pre-incubation period, between 1 February and 15 April, by observing territorial displays and transfers of nest material. Common Buzzards typically refurbish many alternate nests each year, before selecting the one which they eventually use (Cramp and Simmons 1980). We put effort into finding all the active alternate nests of each pair every year. An alternate nest was defined as active when it contained greenery or freshly broken branches during the preincubation period, and was defined as used when eggs were laid in it.

Whenever possible, nests were visited at least three times: (1) about a week after the mean local laying date to assess clutch size; (2) just after hatching to estimate hatching success, brood size, and hatching date; and (3) when the nestlings were older than 45 d to record the number of fledged young (nestlings usually fledge at 50–55 d; Cramp and Simmons 1980). Nests were checked by climbing the nest tree, descending cliffs with a rope, or watching the nest from a vantage point up the slope with a 20–60× telescope. To minimize the risk of disturbance, nest desertion, or egg/chick predation by Black Kites (*Milvus migrans*) or Ravens (*Corvus corax*), only nests that could be checked very rapidly were visited during incubation/early hatching. Thus, estimates of clutch size, hatching success, number of laying pairs and brood size represented a subsample of nests. Hatching date was estimated by backdating from the feather development of nestlings first observed when $\leq$15 d old, by observations at eight focal nests and reference to information contained in Tubbs (1974), Melde (1976), and Cramp and Simmons (1980). Laying date was estimated by subtracting 34 d, the median incubation period (Cramp and Simmons 1980), from hatching date. Prey remains found in the nest cup during each nest visit were identified assuming the minimum possible number of individuals per collection event, and by reference to a reference collection and information contained in Debrot (1982).

Terminology follows Steenhof (1987): a reproductive pair is one which laid $\geq$1 egg, a successful pair is one which raised $\geq$1 nestling until >45 d old, and breeding success is the percentage of successful territorial pairs. A nest area is an area where $\geq$1 alternate nest is found within any one year, but where only one pair nests each year (Sergio and Boto 1999, Sergio and Bogliani 1999).

Statistical Methods. The degree of regularity of nest dispersion was estimated by means of the G-statistic (Brown 1975), calculated as the ratio between the geometric and arithmetic mean of the squared nearest neighbor distances (NND) between used nests and varying between 0 and 1. Values close to 1 (>0.65) indicate a regular dispersion of nest sites (Brown 1975). Statistical significance of the deviation from randomness toward regularity of nest spacing was assessed by means of the test proposed by Clark and Evans (1954). To minimize the bias caused by the NNDs of pairs located along the border of the study area, we applied the correction suggested by Donnelly (1978). Details of mathematical pro-

Table 1. Density, nest spacing, and regularity of nest dispersion of a Common Buzzard population in the Italian pre-Alps (1993–99). Means are given ±SE.

YEAR	TERRITORIAL PAIRS/100 km² (N^a)	MEAN NEAREST NEIGHBOR DISTANCE (m) (N)	G-STATISTIC	z	P^b
1993	28 (32)	1041 ± 98 (16)	0.776	8.9	<0.001
1994	28 (32)	1057 ± 132 (15)	0.660	9.1	<0.001
1995	29 (33)	1074 ± 108 (17)	0.721	9.5	<0.001
1996	29 (33)	1028 ± 131 (16)	0.614	9.0	<0.001
1997	29 (33)	1381 ± 140 (13)	0.785	13.2	<0.001
1998	29 (33)	1082 ± 134 (13)	0.696	9.6	<0.001
1999	31 (35)	1134 ± 88 (18)	0.818	10.7	<0.001
Total	29 (7)[c]	1108 ± 44 (108)	0.703	8.06	<0.001

[a] Number of territorial pairs censused in the study area each year.

[b] Statistical significance of the deviation of nest spacing pattern from randomness toward regularity (Krebs 1998).

[c] Grand mean for the 7 years of study.

cedures can be found in Krebs (1998). To meet the assumptions of normality, NNDs were $\log_e$ transformed, and laying dates were square root transformed prior to parametric tests. All means are given with SE, all tests are two-tailed, and statistical significance was set at $P < 0.05$.

RESULTS

Density and Nest Dispersion. The number of territorial pairs increased from 32 to 35 through the study period. Density correspondingly increased from 28 to 31 pairs/100 km² (Table 1). Mean NND did not vary significantly among years (ANOVA, $F_{6,101} = 1.06$, $P = 0.39$), and was on average 1108 ± 44 m (range = 400–2500 m, $N = 108$; Table 1). The G-statistic indicated a regular dispersion of nest sites in all years except 1996 (Table 1). The spacing pattern significantly deviated from randomness toward regularity in all the study period (Krebs 1998, Table 1).

Nest Sites. Mean altitude of used nests was 585 ± 16 m (range = 270–870 m, $N = 108$) and did not vary significantly among years ($F_{6,102} = 0.43$, $P = 0.86$). Mean altitude of cliff nests was higher than that of tree nests (608 ± 15 m and 483 ± 46 m, respectivly; $F_{1,106} = 10.53$, $P = 0.002$). Fourteen to 15 pairs were closely monitored every year until we were reasonably sure to have detected all their active alternate nests. On average, these pairs had three active alternate nests (range = 1–7; Table 2), with no year-to-year variation in their mean number ($F_{6,96} = 0.02$, $P = 1.0$). Overall, we censused 377 active alternate nest-years; 76% of them were positioned on cliffs and 24% on trees, with no significant among-year variation in the two proportions ($\chi^2 = 1.37$, df = 6, $P = 0.97$; Table 2). Cliff nests accounted for 81% of 108 used nest-years, with no year-to-year variation in their frequency of occurrence ($\chi^2 = 5.53$, df = 6, $P = 0.48$; Table 2). Of 52 nests which were used at least once during the seven years of study, 15 were placed on trees, 13 on bare rock ledges, and 24 at the base of trees growing from the cliff faces. Of 15 tree nests, seven were placed on sweet chestnut, two on Scotch pine (*Pinus silvestris*), two on oak (*Quercus* spp.), and one each on spruce fir (*Picea excelsa*), Weymouth pine (*Pinus strobus*), common lime (*Tilia europaea*), and European ash (*Fraxinus excelsior*). The mean height of these 15 nests on trees was 15 ± 1 m. Five pairs had alternate nests on both cliffs and trees, and laid eggs in both types of nests in different years. The mean number of years that a nest was consecutively occupied was 1.2 ± 0.1 for tree nests (range = 1–3, $N = 15$) and 2.1 ± 0.3 for cliff nests (range = 1–7, $N = 37$); the difference between the two was significant (Mann-Whitney U test, $z = -2.07$, $P = 0.038$).

Each year, 16–21% of the active alternate nests were taken over by migratory Black Kites on their arrival (18 March to beginning of April; Sergio and Boto 1999); this percentage did not vary significantly among years ($\chi^2 = 2.88$, df = 6, $P = 0.82$; Table 2). To assess whether Common Buzzards may have selected cliff or tree nests, we compared the frequency of cliff nesting between used nests and active alternate nests. We removed all nests taken over by Black Kites from the sample of active alternate nests, as these were actually not available to buzzards. There was no significant selection for

Table 2. Mean number of active alternative nests/pair, percentage of cliff nests, and percentage of nests taken over by Black Kites in a Common Buzzard population in the central Italian pre-Alps (1993–99). Means are given ±SE.

VARIABLE	YEAR							
	1993	1994	1995	1996	1997	1998	1999	TOTAL
Mean No. of active alternative nests/pair (*N*)	3.0 ± 0.4 (14)	3.1 ± 0.4 (15)	2.9 ± 0.4 (15)	3.0 ± 0.4 (14)	3.1 ± 0.5 (14)	3.1 ± 0.5 (15)	3.1 ± 0.5 (15)	3.0 ± 0.2 (103)
Percent cliff nests among active alternative nests (*N*)	74 (54)	74 (54)	73 (52)	76 (54)	79 (53)	80 (54)	73 (56)	76 (377)
Percent cliff nests among used nests (*N*)	81 (16)	91 (11)	73 (15)	75 (20)	92 (13)	93 (14)	74 (19)	81 (108)
Percent active alternative nests taken over by Black Kites	19	20	21	19	17	17	16	18

Table 3. Mean (±SE) estimates of reproductive success of a Common Buzzard population in the central Italian pre-Alps (1993–99).

VARIABLE	1993	1994	1995	1996	1997	1998	1999	1993–1999
Number of monitored pairs	13	13	11	18	12	14	19	100
Percent successful pairs	69	62	55	83	75	86	68	72
Mean No. of young fledged per territorial pair	1.23 ± 0.26	0.85 ± 0.22	0.63 ± 0.20	1.44 ± 0.22	1.08 ± 0.23	1.14 ± 0.18	0.95 ± 0.78	1.07 ± 0.08
Mean No. of young fledged per successful pair	1.77 ± 0.15	1.38 ± 0.18	1.17 ± 0.17	1.73 ± 0.18	1.44 ± 0.18	1.33 ± 0.14	1.38 ± 0.14	1.49 ± 0.07

cliff or tree nests within any of the seven study years ($\chi^2 \leq 1.71$, df = 6, $P \geq 0.19$).

Breeding Season. Birds were observed on their territories all year. Mean laying date did not vary significantly among years (Kruskal-Wallis χ^2 = 11.15, df = 6, $P = 0.08$). First egg laying dates ranged from 7 March to 30 April, averaging 9 April (SE = 1.60 d, $N = 45$). No cases of replacement clutches were observed in any year, even after breeding failures occurred early in the breeding season. The mean date of the first flight of a nestling in a brood was 19 June (SE = 2.76 d, earliest = 4 June, latest = 5 July, $N = 14$ broods).

Productivity. Mean clutch size was 2.32 ± 0.13 ($N = 19$). Hatching success was 91% ($N = 33$ eggs from 14 clutches). Brood size at hatching was 2.14 ± 0.18 ($N = 14$). Thirty-three of 37 pairs that were monitored laid eggs, and raised a mean of 1.11 ± 0.15 young per pair. There was no year-to-year variation in the percentage of successful territorial pairs ($\chi^2 = 5.16$, df = 6, $P = 0.52$; Table 3). Overall breeding success was 72% (Table 3). The mean number of fledged young per territorial pair was 1.07 (Table 3), with no significant among-year differences ($F_{6,93} = 1.52$, $P = 0.18$). The mean number of fledged young per successful pair was 1.49 (Table 3), and did not vary significantly among years ($F_{6,65} = 1.60$, $P = 0.16$). Causes of failure were usually unknown, apart from two cases of partial brood predation by Black Kites, and one case in which a young was electrocuted just after fledging.

The number of fledged young declined with laying date, but not significantly ($r = -0.17$, $N = 44$, $P = 0.27$). There was no significant correlation between the number of fledged young and nest site elevation ($r = 0.04$, $N = 99$, $P = 0.67$) or NND ($r = 0.11$, $N = 88$, $P = 0.30$). The mean number of fledged young did not differ between cliff nests and tree nests ($F_{1,98} = 0.002$, $P = 0.97$).

Diet. Diet was dominated by birds, mammals, and reptiles which accounted for 46, 29, and 21% of 142 prey remains collected, respectively, in the nests of 20 pairs (Table 4). We were able to assess the age of 36 avian prey individuals: 19% were nestlings, 72% were recently fledged juveniles, and 8% were adult individuals.

Table 4. Diet of breeding Common Buzzards in the Italian pre-Alps (1993–99), as estimated by food remains (N = 142) collected from nests. Remains collected during 67 visits to 25 nests.

PREY CATEGORY	NUMBER OF ITEMS (%)
Birds	66 (46)
Blackbird (*Turdus merula*)	26 (18)
Eurasian Jay (*Garrulus glandarius*)	21 (15)
Others[a]	8 (6)
Unidentified Passeriformes	11 (8)
Mammal	41 (29)
Common Mole (*Talpa europaea*)	8 (6)
Muridae spp.[b]	12 (8)
Others[c]	21 (15)
Reptiles[d]	30 (21)
Amphibians[e]	4 (3)
Fish	1 (1)

[a] Includes: European Robin (*Erithacus rubecula*) (N = 2), Green Woodpecker (*Picus viridis*) (N = 2), Eurasian Sparrowhawk (*Accipiter nisus*) (N = 1), Great Spotted Woodpecker (*Dendrocopos major*) (N = 1), Chaffinch (*Fringilla coelebs*) (N = 1).

[b] Includes: *Pitymys* spp. (N = 2), bank vole (*Clethrionomys glareolus*) (N = 1), wood mouse (*Apodemus sylvaticus*) (N = 1), yellow necked mouse (*Apodemus flavicollis*) (N = 1), house mouse (*Mus musculus* (N = 1), unidentified Muridae (N = 5).

[c] Includes: red squirrel (*Sciurus vulgaris*) (N = 4), *Crocidura* spp. (N = 1), weasel (*Mustela nivalis*) (N = 1), dormouse (*Myoxus glis*) (N = 1), brown hare (*Lepus europaeus*) (N = 1), unidentified mammal (N = 13).

[d] Includes: western whip snake (*Coluber viridiflavus*) (N = 6), Aesculapian snake (*Elaphe longissima*) (N = 7), unidentified Colubridae (N = 11), common wall lizard (*Podarcis muralis*) (N = 4), slow worm (*Anguis fragilis*) (N = 2).

[e] Includes: common toad (*Bufo bufo*) (N = 4).

DISCUSSION

Eighty-one percent of the nests used for breeding in our area were placed on cliffs. In most of Europe, Common Buzzards are tree nesters, and the availability of woodland can be a key factor limiting population density (Dare and Barry 1990, Bijlsma 1993, Halley 1993). Cliff nesting does occur throughout their range, but generally at low frequency, and in areas with limited tree availability (Dare 1995). In our study area, buzzards tended to select nest trees within woodland patches that were more mature than those around random trees (F. Sergio and C. Scandolara unpubl. data). Among alternate nest sites, no preference was evident between cliff and tree nests, even though cliff nests were occupied for higher numbers of consecutive years than tree nests. High frequency of cliff nesting may have been caused by low availability of sufficiently mature woodland patches, even though single tall trees were relatively abundant and widespread in the study area. This is consistent with

Table 5. Density, nearest neighbor distance (NND), and productivity of selected Common Buzzard populations in Europe (1980s–90s).

AREA	HABITAT	DENSITY (*N*)[a]	NND (km) (*N*)	CLUTCH SIZE (*N*)	BREEDING SUCCESS[b] (*N*)	MEAN NO. OF FLEDGED YOUNG PER TERRITORIAL PAIR (*N*)	MEAN NO. OF FLEDGED YOUNG PER BREEDING PAIR (*N*)	MEAN NO. OF FLEDGED YOUNG PER SUCCESSFUL PAIR (*N*)	SOURCE
Scotland, Highlands	Low mountains	23 (22)							Halley 1993
Scotland, Argyll	Low mountains			2.24 (73)			1.75 (73)	1.98 (66)	Austin & Houston 1997
Scotland, south	Low mountains	8 (19)	1.9 (16)						Graham et al. 1995
Scotland, Glen Urquhart	Low mountains		1.1 (17)	2.40 (162)			1.13 (171)	1.50 (129)	Swann & Etheridge 1995
Scotland, Moray	Low mountains		1.7 (12)	2.90 (64)			2.23 (140)	2.50 (123)	Swann & Etheridge 1995
Wales, Snowdonia	Low mountains	10 (96)[c]	2.0 (96)[c]	2.09 (46)	51 (91)	0.64 (91)	1.00 (58)	1.39 (42)	Dare 1995
Wales, Hiraethog	Low mountains	14 (62)[c]	1.5 (62)[c]	2.40 (39)	67 (57)	0.88 (57)	1.16 (43)	1.35 (37)	Dare 1995
England, Devon	Lowland	52 (17)	1.1 (17)	3.36 (11)	58 (66)	0.95 (66)	1.40 (45)	1.60 (38)	Dare 1998
Netherlands, Drenthe	Lowland	116[d]	0.8 (294)	2.73 (292)	40 (710)	0.87 (710)		2.24 (281)	Bijlsma 1993
Poland, central	Lowland	17 (19)			63 (200)	1.67 (200)	1.78 (186)	2.34 (126)	Goszczynski 1997
Germany, Rhine	Lowland	10[e]			67 (366)	1.15 (366)		1.73 (244)	Kostrzewa 1996
Germany, S. Holsteins	Lowland	45 (45)		2.56 (104)	63 (214)		1.23 (164)	2.04 (135)	Hohmann 1995
Switzerland, Lac Leman	Mountains	13 (17)							Henrioux & Henrioux 1995
Austria, pre-Alps	Mountains	9 (10)							Dvorak et al. 1993
Italy, Apennines	Mountains	8 (17)	2.5 (17)						Penteriani & Faivre 1997
Italy, central Alps	Mountains	29 (53)	1.1 (108)	2.32 (19)	72 (100)	1.07 (100)	1.11 (33)	1.49 (72)	This study

[a] Number of pairs/100 km^2.

[b] Percentage of territorial pairs raising at least one chick until fledging.

[c] Source: Dare and Barry (1990).

[d] Source: Bijlsma (1997); sample size not given.

[e] Source: Kostrzewa (1991); sample size not given.

buzzards responding more to the structural characteristics of breeding woodland patches than to the micro-characteristics of individual nesting trees. Alternatively, cliff nesting may be a response to the recent history of persecution and nest robbing suffered by the species in this area (Bianchi et al. 1969). From discussion with local villagers, we know of at least three territories where nestlings were regularly collected up until the 1970s, and we have indirect evidence of nest robbing at one easily accessible site during our study. In a high-persecution area of Sicily, only two tall and inaccessible tree nests out of seven were not robbed of chicks (Cairone 1982). Cliff nests are generally less accessible than tree nests to humans and cliffs allow buzzards to place their nests higher from the ground than trees. In our study area, cliff nests were also on average at a higher elevation than tree nests, affording additional advantages in terms of distance from sources of human disturbance, which are mostly located at low altitude in the valley floors. Thus, the interaction between the selective pressure associated with potential nest robbing and the low availability of mature woodland patches may cause the local high frequency of cliff nesting, a pattern also observed in the local Black Kite population (Sergio and Boto 1999). Each buzzard pair had on average three alternate nests, and up to seven, within its nest area. This is in agreement with data from other parts of Europe; Tubbs (1974) reported an average of 3.2 alternate nests per nest area (range 1–14) for the New Forest of England. In our study area, some nests, especially on cliffs, were used for a number of consecutive years. However, most nests were used for only one or two years. Such frequent nest switching was possibly enhanced by competition with Black Kites, but has also been reported in other Common Buzzard populations free of such competition (Tubbs 1974, Cramp and Simmons 1980).

Despite the sporadic persecution, the observed density and productivity were in the range of that reported for other European populations (Table 5). In Europe, Common Buzzard breeding densities peak in areas of lowland traditional farmland interspersed with abundant mature woodlots (Bijlsma 1997). Density in the Italian pre-Alps was only slightly lower to that found in such optimal agricultural habitats (Bijlsma 1993, Kostrzewa 1996, Dare 1998, Goszczynski 1997), and higher than any published estimate for mountainous areas (Dare and Barry 1990, Halley 1993, Graham et al. 1995, Penteriani and Faivre 1997; Table 5). Productivity was also comparable or higher than those reported for other mountainous environments (Dare 1995, Swann and Etheridge 1995) and for some lowland areas (Kostrzewa 1996, Dare 1998; Table 5).

The diet of the study population was diverse, as typical for this species (Cramp and Simmons 1980), and dominated by birds, small mammals, and snakes. We caution that diet analyses based on prey remains tend to overestimate large or conspicuous prey species compared to analysis of pellets or direct observations of prey delivered to the nest (e.g., Goszczynski and Pilatowski 1986, Redpath et al. 2001, Marchesi et al. 2002). However, preliminary results of the analysis of 366 pellets gave a picture of diet composition similar to that obtained by the analysis of remains in the nest (F. Sergio and C. Scandolara unpubl. data). Overall, the high frequency of reptiles confirms the importance of such prey for Common Buzzards in Mediterranean countries and at southern latitudes (Cramp and Simmons 1980, Haberl 1995). Finally, the frequent occurrence of typical woodland species in the diet agreed with our many qualitative observations of individuals hunting by sit-and-wait tactics within woodland habitats. On such occasions, buzzards usually perched on intermediate-height branches scanning the forest floor and canopy for periods of 2–5 min, before moving to another perch on a nearby tree (pause-travel tactic; Widén 1994).

The exploitation of a wide range of habitats, the selection of suitable nest sites inaccessible to humans, and the adoption of a diverse opportunistic diet allowed Common Buzzards to settle at a relatively good density and reproduce successfully within the heavily wooded landscape of the central Italian pre-Alps. The local breeding population was stable or slightly increasing in number. No strong threats were apparent: persecution was sporadic and the continued succession of coppice woodland to mature forest could further increase available nesting and foraging habitat. The role of habitat availability, weather, diet, and competition with Black Kites as potential factors limiting density and breeding performance of the local Common Buzzard population is currently under investigation.

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